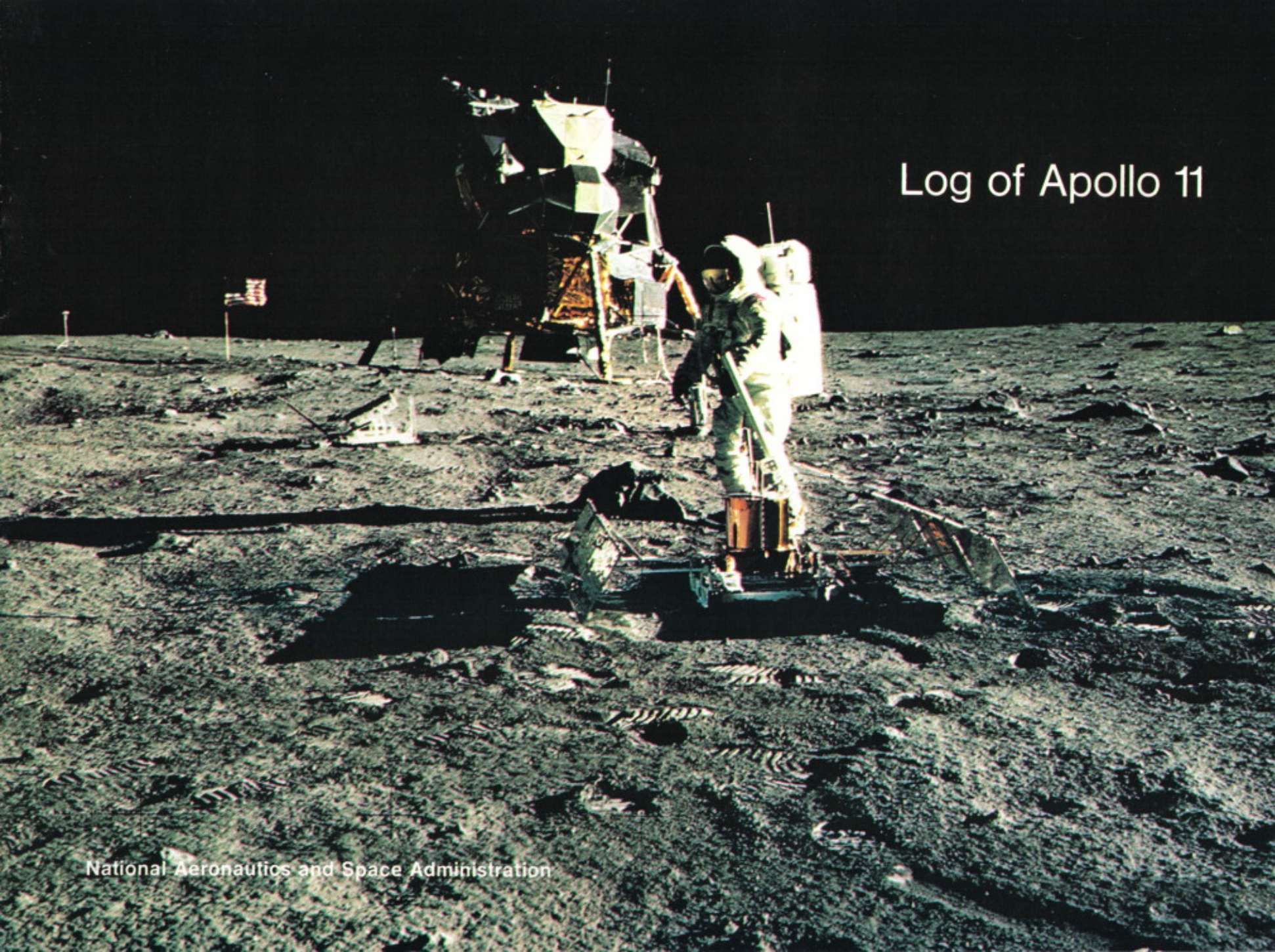

Log of Apollo 11
National Aeronautics and Space Administration

Cover: Aldrin stands by deployed experiment package, with lunar module, flag and TV camera breaking the monotony of the lunar surface in the background.

Apollo 11 Crew: (left to right) Commander Neil A. Armstrong, Command Module Pilot Michael Collins, and Lunar Module Pilot Edwin E. (Buzz) Aldrin, Jr.

JULY 16

9:32 a.m. EDT–On schedule to within less than a second, Apollo 11 blasts off from Launch Pad 39A at Cape Kennedy, Florida to start what is looked upon as the greatest single step in human history—a trip to the Moon, a manned landing and return to Earth.

Watching is a world-wide television audience and an estimated million eyewitnesses. Standing three and one-half miles away on the sandflats or seated in grandstands are half the members of the United States Congress and more than 3,000 newsmen from 56 countries.

Strapped to their couches in the command module atop the 363-foot, 7.6-million-pound thrust space vehicle are three astronauts, each born in 1930, each weighing 165 pounds, all within an inch of the same height—five feet, 11 inches. They are Commander Neil A. Armstrong, civilian and ex-test pilot; Command Module Pilot Michael Collins, and Lunar Module Pilot Edwin E. (Buzz) Aldrin, Jr., the latter two, officers of the U. S. Air Force.

The launch comes after a 28-hour countdown. It takes place in highly suitable weather, with winds 10 knots from the southeast, temperature in the mid-80's, and clouds at 15,000 feet.

At 4:15 a.m., the astronauts had been awakened. After a breakfast of orange juice, steak, scrambled eggs, toast and coffee, they began suiting up at 5:35 a.m. At 6:27 a.m., they left in an air-conditioned van for the launch pad eight miles away. At 6:54 a.m., Armstrong entered the command module and took position on the left. He was followed five minutes later by Collins, on the right, and Aldrin, in the center.

Two minor problems that developed in the ground equipment, a leaky valve and a faulty signal light were corrected while the astronauts were en route to the pad.

The Apollo access arm retracted at 9:27 a.m. Eight and nine-tenths seconds before launch time, the first of the Saturn V's first stage engines ignited. From the viewing stands, the flame appeared as a bright yellow-orange star on the horizon. Soon the other four engines fired and the light of the first engine became a huge fireball that lit the scene like a rising Sun. No sound was heard. For two seconds the vehicle built up thrust. The hold down clamps were released and the space vehicle began moving slowly upward from the pad, as near 9:32 a.m. as human effort could make it.

As it reached the top of the service tower, the hard-edged clattering thunder of the firing engines

rolled over the scrubby Florida landscape and engulfed the viewers like a tidal wave. They witnessed the beginning of the fifth manned Apollo flight, the third to the vicinity of the Moon and the first lunar landing mission.

From Launch Control the last words were: "Good luck and Godspeed." Commander Armstrong replied, "Thank you very much. We know this will be a good flight."

9:35 a.m.–The spacecraft is 37 nautical miles high, downrange 61 nautical miles and traveling at 9,300 feet per second or about 6,340 miles per hour. Armstrong confirms the engine skirt and launch escape tower separations.
9:44 a.m.–With the three Saturn stages fired one after another and the first two jettisoned, Apollo 11 enters a 103 nautical mile-high Earth orbit, during which the vehicle is carefully checked by the astronauts and by the ground control crew.
12:22 p.m.–Another firing of the third-stage engine, still attached to the command service module, boosts Apollo 11 out of orbit midway in its second trip around the Earth and onto its lunar trajectory at an initial speed of 24,200 miles an hour.
12:49 p.m.–While the spacecraft moves farther and farther from Earth, the lunar landing craft, code-named Eagle, is unpacked from its compartment atop the launch rockets. The astronauts first fire some explosive bolts. These cause the main spaceship, given the name Columbia, to separate from the adapter and blow apart the four panels that make up its sides, exposing the lunar module (LM) tucked inside. They stop the spacecraft about 100 feet away —34 feet farther than they were supposed to—turn the ship around, facing the landing craft, and dock head-to-head with it. The docking complete, the LM's connections with the adapter are blown loose and the mated command/service and lunar modules separate from the rocket and continue alone toward the Moon.
2:38 p.m.–By dumping its leftover fuel the third rocket stage is fired into a long solar orbit to remove it from Apollo 11's path.
2:43 p.m.–With the flight on schedule and proceeding satisfactorily, the first scheduled midcourse correction is considered unnecessary.
2:54 p.m.–The spacecraft is reported 22,000 nautical miles from Earth and traveling at 12,914 feet per second. Crew members keep busy with housekeeping duties.
8:52 p.m.–Mission Control at Houston, Texas, says good night to the crew as they prepare to go to sleep two hours early.
10:59 p.m.–Because of the pull of Earth's gravity, the spacecraft has slowed to 7,279 feet per second at a distance of 63,880 nautical miles from Earth.

JULY 17

8:48 a.m.–Mission Control gives Apollo crew a brief review of the morning news, including sports developments. They are informed about the progress of the Russian space ship Lunar 15 and that Vice President Spiro T. Agnew, ranking government official at the Apollo 11 blastoff, has called for putting a man on Mars by the year 2000.
12:17 p.m.–Midcourse correction is made with a three-second burn, sharpening the course of the spacecraft and testing the engine that must get them in and out of lunar orbit.
7:31 p.m.–Astronauts begin first scheduled color telecast from spacecraft, showing view of the Earth from a distance of about 128,000 nautical miles. During the 36-minute transmission, views are also shown of the inside of the command module.
9:42 p.m.–Mission control bids the crew goodnight.

JULY 18

9:41 a.m.–Mission Control lets Astronauts sleep an hour later than scheduled on the third day of the outward journey. After breakfast, they begin housekeeping chores, such as charging batteries, dumping waste water, and checking fuel and oxygen reserves. Announcement is made to them that course corrections scheduled for afternoon will not be necessary.
2:57 p.m.–Astronauts are given report on day's news.
4:40 p.m.–One of the clearest television transmissions ever sent from space is begun, with the spacecraft 175,000 nautical miles from Earth and 48,000 from the Moon. It lasts an hour and 36 minutes. While in progress, the hatch to the LM is opened and Armstrong squeezes through the 30-inch-wide tunnel to inspect it. He is followed by Aldrin.
10:00 p.m.–Mission Control tells the crew goodnight.
11:12 p.m.–Velocity of spacecraft has slowed to 2,990 ft. per second just before entering the Moon's sphere of influence at a point 33,823 nautical miles away from it.

JULY 19

6:58 a.m.–Astronauts call Mission Control to inquire about scheduled course correction and are told it has been cancelled. They are also advised they may go back to sleep.
8:32 a.m.–Mission Control signals to arouse crew and to start them on breakfast and housekeeping chores.
10:01 a.m.–Astronauts are given review of day's news and are told of worldwide interest in Moon mission.
10:31 a.m.–Collins reports: "Houston, it's been a real change for us. Now we are able to see stars again and recognize constellations for the first time on the trip. The sky is full of stars, just like the nights on Earth. But all the way

here we have just been able to see stars occasionally and perhaps through monoculars, but not recognize any star pattern."

10:42 a.m.–Armstrong announces: "The view of the Moon that we've been having recently is really spectacular. It fills about three-quarters of the hatch window and, of course, we can see the entire circumference, even though part of it is in complete shadow and part of it's in earth-shine. It's a view worth the price of the trip."

12:58 p.m.–The crew is informed by Mission Control: "We're 23 minutes away from the LOI (Lunar Orbit Insertion) burn. Flight Director Cliff Charlesworth is polling flight controllers for its status now." Then quickly, seconds later: "You are go for LOI." Aldrin replies: "Roger, go for LOI."

1:13 p.m.–Spacecraft passes completely behind the Moon and out of radio contact with the Earth for the first time.

1:28 p.m.–The spacecraft's main rocket, a 20,500-pound-thrust engine, is fired for about six minutes to slow the vehicle so that it can be captured by lunar gravity. It is still behind the Moon. The resulting orbit ranges from a low of 61.3 nautical miles to a high of 168.8 nautical miles.

1:55 p.m.–Armstrong tells Mission Control: "We're getting this first view of the landing approach. This time we are going over the Taruntius crater and the pictures and maps brought back by Apollos 8 and 10 give us a very good preview of what to look at here. It looks very much like the pictures, but like the difference between watching a real football game and watching it on TV—no substitute for actually being here."

About 15 minutes later he adds: "It gets to be a lighter gray, and as you get closer to the subsolar point, you can definitely see browns and tans on the ground."

And a few moments still later: "When a star sets up here, there's no doubt about it. One instant it's there and the next instant it's just completely gone."

3:56 p.m.–A 35-minute telecast of the Moon's surface begins. Passing westward along the eastern edge of the Moon's visible side, the camera is focused especially on the area chosen as a landing site.

5:44 p.m.–A second burn of the spacecraft's main engine, this one for 17 seconds, is employed while the spacecraft is on the back side of the Moon to stabilize the orbit at about 54 by 66 nautical miles.

6:57 p.m.–Armstrong and Aldrin crawl through the tunnel into the lunar module to give it another check. The spacecraft is orbiting the Moon every two hours.

JULY 20

9:27 a.m.—Aldrin crawls into the lunar module and starts to power-up the spacecraft. About an hour later, Armstrong enters the LM and together they continue to check the systems and deploy the landing legs.

1:46 p.m.–The landing craft is separated from the command module, in which Collins continues to orbit the Moon.

2:12 p.m.–Collins fires the command ship's rockets and moves about two miles away.

3:08 p.m.–Armstrong and Aldrin, flying feet first and face down, fire the landing craft's descent engine for the first time.

3:47 p.m.–Collins, flying the command ship from behind the Moon, reports to Earth that the landing craft is on its way down to the lunar surface. It is the first Mission Control has heard of the action. "Everything's going just swimmingly. Beautiful!" Collins reports.

4:05 p.m.–Armstrong throttles up the engine to slow the LM before dropping down on the lunar surface. The landing is not easy. The site they approach is four miles from the target point, on the southwestern edge of the Sea of Tranquility. Seeing that they are approaching a crater about the size of a football field and covered with large rocks, Armstrong takes over manual control and steers the craft to a smoother spot. His heartbeat has risen from a normal 77 to 156.

While Armstrong flies the landing craft, Aldrin gives him altitude readings: "Seven hundred and fifty feet, coming down at 23 degrees . . . 700 feet, 21 down . . . 400 feet, down at nine . . . Got the shadow out there . . . 75 feet, things looking good . . . Lights on . . . Picking up some dust . . . 30 feet, 2½ down . . . Faint shadow . . . Four forward. Four forward, drifting to the right a little . . . Contact light. Okay, engine stop."

When the 68-inch probes beneath three of the spacecraft's four footpads touch down, flashing a light on the instrument panel, Armstrong shuts off the ship's engine.

4:18 p.m.–The craft settles down with a jolt almost like that of a jet landing on a runway. It is at an angle of no more than four or five degrees on the right side of the Moon as seen from Earth. Armstrong immediately radios Mission Control: **"The Eagle has landed."**

Aldrin, looking out of the LM window, reports: "We'll get to the details around here, but it looks like a collection of just about every variety of shapes, angularities and granularities, every variety of rock you could find. The colors vary pretty much depending on how you're looking. . . . There doesn't appear to be much of a general color at all; however, it looks as though some of the rocks and boulders, of which there are quite a few in the near area . . . are going to have some interesting colors to them."

A few moments later he tells of seeing numbers of craters, some of them 100 feet across, but the largest number

Left: This is the scene on television witnessed by millions on Earth as Armstrong descends the LM ladder just prior to becoming the first human being to set foot on the Moon.

Below: The footprint on the Moon, something new in man's long stretch of history.

only one or two feet in diameter. He sees ridges 20 or 30 feet high, two-foot blocks with angular edges, and a hill half a mile to a mile away.

Finally, in describing the surface, Aldrin says: "It's pretty much without color. It's gray and it's a very white, chalky gray, as you look into the zero phase line, and it's considerably darker gray, more like ashen gray as you look up 90 degrees to the Sun. Some of the surface rocks close in here that have been fractured or disturbed by the rocket engine are coated with this light gray on the outside, but when they've been broken they display a dark, very dark gray interior, and it looks like it could be country basalt."

The first task after landing is that of preparing the ship for launching, of seeing that all is in readiness to make the ascent back to a rendezvous with the command spacecraft orbiting above.

6:00 p.m.–With everything in order, Armstrong radios a recommendation that they plan to start the EVA (Extra Vehicular Activity), earlier than originally scheduled, at about 9:00 p.m. EDT. Mission Control replies: "We will support you anytime."

10:39 p.m.–Later than proposed at 6:00 p.m., but more than five hours ahead of the original schedule, Armstrong opens the LM hatch and squeezes through the opening. It is a slow process. Strapped to his shoulders is a portable life support and communications system weighing 84 pounds on Earth, 14 on the Moon, with provision for pressurization; oxygen requirements and removal of carbon dioxide.

Armstrong moves slowly down the 10-foot, nine-step ladder. On reaching the second step, he pulls a "D-ring," within easy reach, deploying a television camera, so arranged on the LM that it will depict him to Earth as he proceeds from that point.

Down the ladder he moves and halts on the last step. "I'm at the foot of the ladder," he reports. "The LM footpads are only depressed in the surface about one or two inches . . . the surface appears to be very, very finegrained, as you get close to it, it's almost like a powder."

10:56 p.m.–Armstrong puts his left foot to the Moon. It is the first time in history that man has ever stepped on anything that has not existed on or originated from the Earth.

"That's one small step for a man, one giant leap for mankind," Armstrong radios. Aldrin is taking photographs from inside the spacecraft.

The first print made by the weight of man on the Moon is that of a lunar boot which resembles an oversized galosh.

Its soles are of silicon rubber and its 14-layer sidewalls of aluminized plastic. Specially designed for super-insulation, it protects against abrasion and has reduced friction to facilitate donning. On Earth, it weighs four pounds, nine ounces; on the Moon, 12 ounces.

Armstrong surveys his surroundings for a while and then moves out, testing himself in a gravity environment one-sixth of that on Earth. "The surface is fine and powdery," he says. "I can pick it up loosely with my toe. It does adhere in fine layers like powdered charcoal to the sole and sides of my boots. I only go in a small fraction of an inch. Maybe an eighth of an inch, but I can see the footprints of my boots and the treads in the fine sandy particles.

"There seems to be no difficulty in moving around as we suspected. It's even perhaps easier than the simulations. . . ."

Feeling more confident, Armstrong begins making a preliminary collection of soil samples close to the landing craft. This is done with a bag on the end of a pole.

"This is very interesting," he comments. "It's a very soft surface, but here and there . . . I run into a very hard surface, but it appears to be very cohesive material of the same sort. . . . It has a stark beauty all its own. It's like much of the high desert of the United States."

He collects a small bagful of soil and stores it in a pocket on the left leg of his space suit. This is done early, according to plan, to make sure some of the Moon surface is returned to Earth in case the mission has to be cut short.

11:11 p.m.–After lowering a Hasselblad still camera to Armstrong, Aldrin emerges from the landing craft and backs down the ladder, while his companion photographs him.

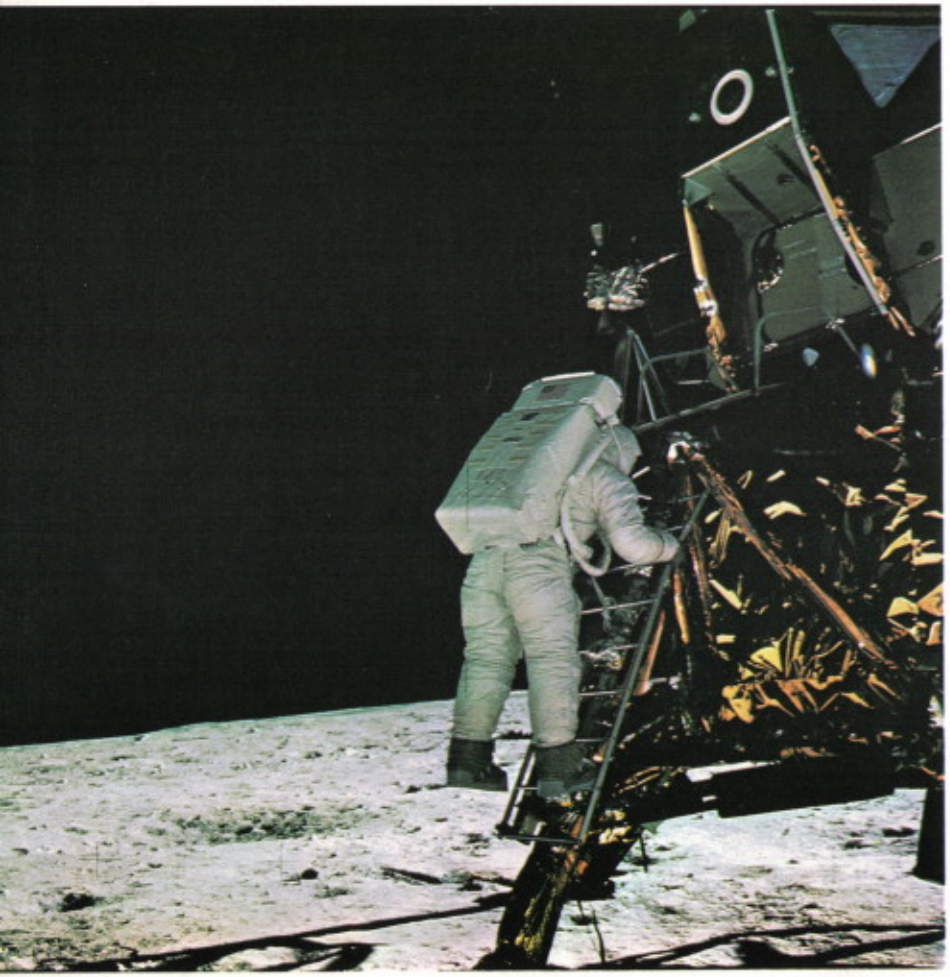
"These rocks . . . are rather slippery," Armstrong says. The astronauts report that the powdery surface seems to fill up the fine pores on the rocks, and they tend to slide over them rather easily.

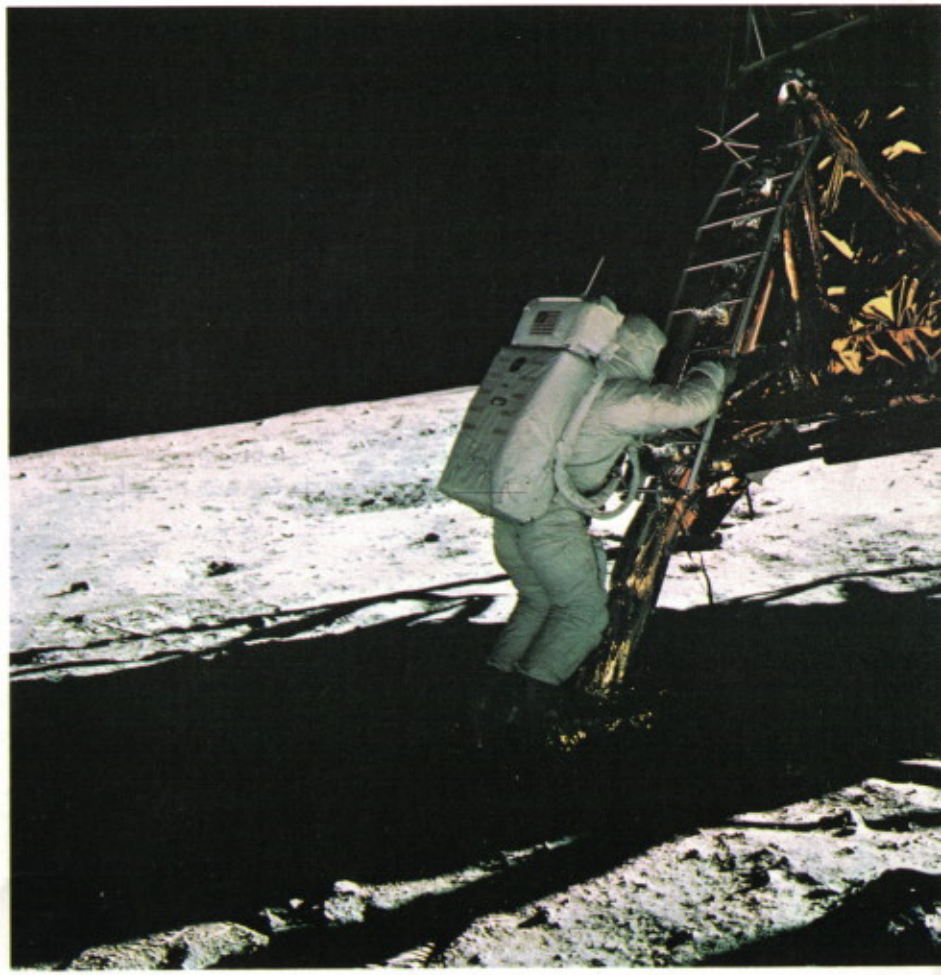
Armstrong fits a long focal length lens into position on the TV camera and trains it upon a small, stainless steel plaque on one of the legs of the landing craft. He reads: "Here men from the planet Earth first set foot on the Moon. July 1969 A.D. We came in peace for all mankind." Below the inscription are the names of the Apollo crew and President Nixon.

Armstrong next removes the TV camera from its fixed position on the LM and moves it away about 40 feet so it can cover the area in which the astronauts will operate.

As scheduled, the astronauts set up the first of three experiments. From an outside storage compartment in the LM, Aldrin removes a foot-long tube containing a roll of aluminum foil. Inside the roll is a telescoped pole that is driven into the lunar surface, after which the foil is

In this sequence of photographs taken by Armstrong, Aldrin is shown as he descends LM ladder.





suspended from it, with the side marked "Sun" next to the Sun. Its function will be to collect the particles of "solar wind" blowing constantly through space so that they can be brought back and analyzed in the hope they will provide information on how the Sun and planets were formed.

11:41 p.m.–From a leg of the spacecraft, the astronauts take a three-by-five-foot, nylon United States flag, its top edge braced by a spring wire to keep it extended on the windless Moon and erect it on a staff pressed into the lunar surface.

Taken to the Moon are two other U.S. flags, to be brought back and flown over the houses of Congress, the flags of the 50 States, the District of Columbia and U.S. territories, the United Nations flag, as well as those of 136 foreign countries.

11:47 p.m.–Mission Control announces: "The President of the United States is in his office now and would like to say a few words to you." Armstrong replies: "That would be an honor."

11:48 p.m.–The astronauts listen as the President speaks by telephone: "Neil and Buzz. I am talking to you from the Oval Room at the White House. And this certainly has to be the most historic telephone call ever made . . . . For every American this has to be the proudest day of our lives. And for people all over the world I am sure they, too, join with Americans in recognizing what a feat this is. Because of what you have done, the heavens have become a part of man's world. As you talk to us from the Sea of Tranquility, it inspires us to redouble our efforts to bring peace and tranquility to Earth. For one priceless moment, in the whole history of man, all the people on this Earth are truly one."

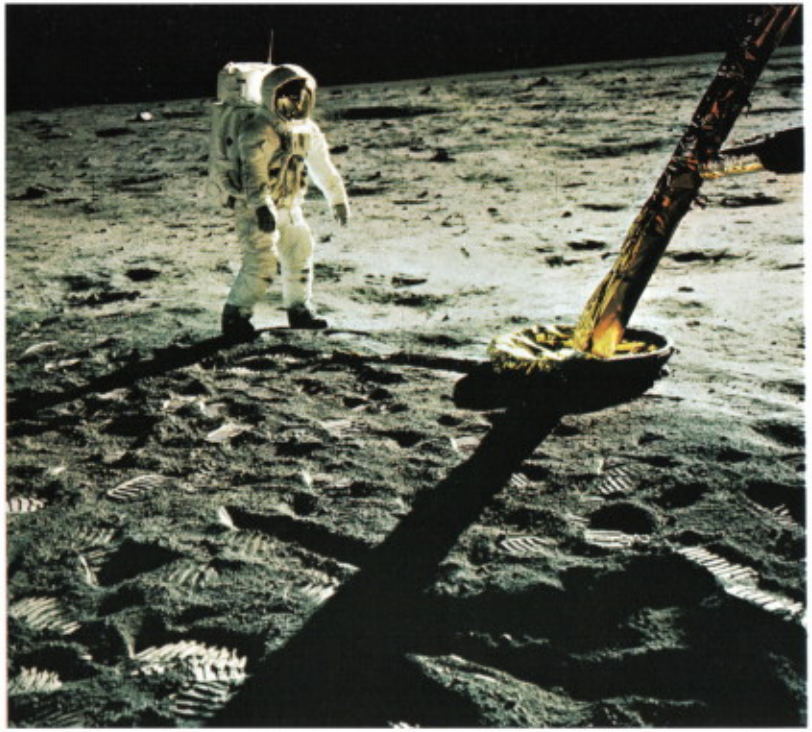
As the President finishes speaking, Armstrong replies: "Thank you, Mr. President. It's a great honor and privilege for us to be here representing not only the United States but men of peace of all nations. And with interest and a curiosity and a vision for the future. It's an honor for us to be able to participate here today."

The two astronauts stand at attention, saluting directly toward the television as the telephone conversation concludes.

Armstrong next sets up a folding table and opens on it two specimen boxes. Using tongs and the lunar scoop, a quantity of rocks and soil are picked up and sealed in the boxes, preparatory to placing them in the ascent stage of the landing craft.

Aldrin, meanwhile, opens another compartment in the ship and removes two devices to be left on the Moon, taking each out about 30 feet from the ship. One is a seismic detector, to record moonquakes, meteorite impact, or volcanic eruption, and the other a laser-reflector, a device designed to make a much more precise measurement of Earth-Moon distances than has ever been possible before.

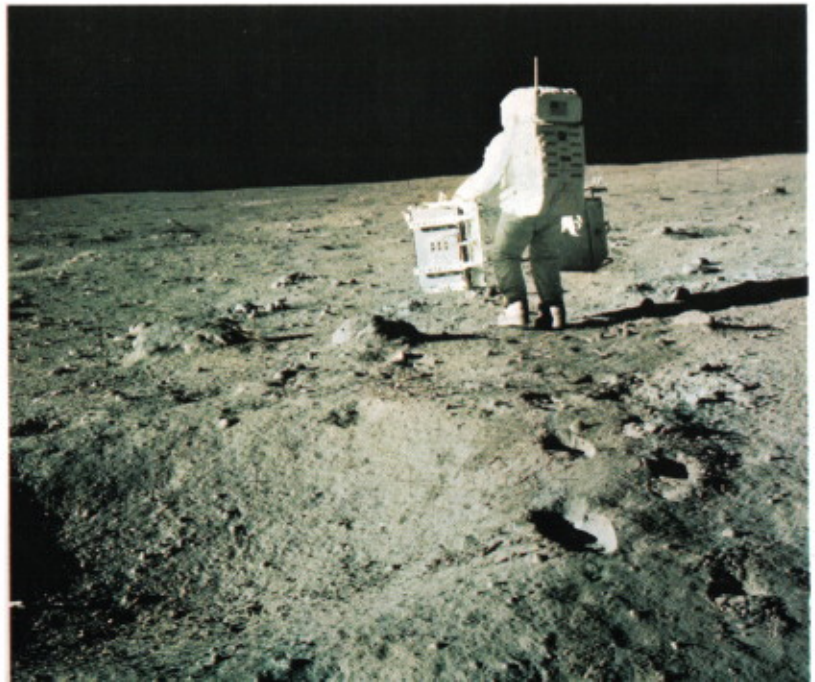
Aldrin deploys instruments to collect particles of "solar wind."

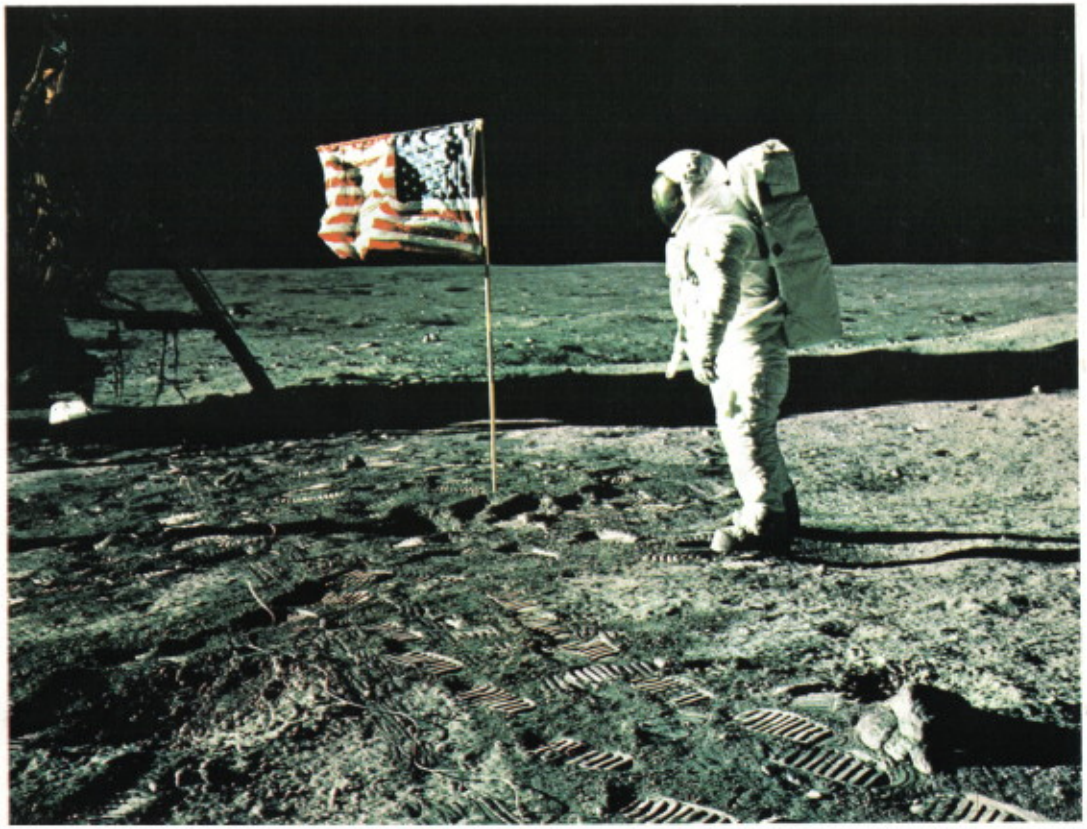


Left: Aldrin approaches leg of landing craft.

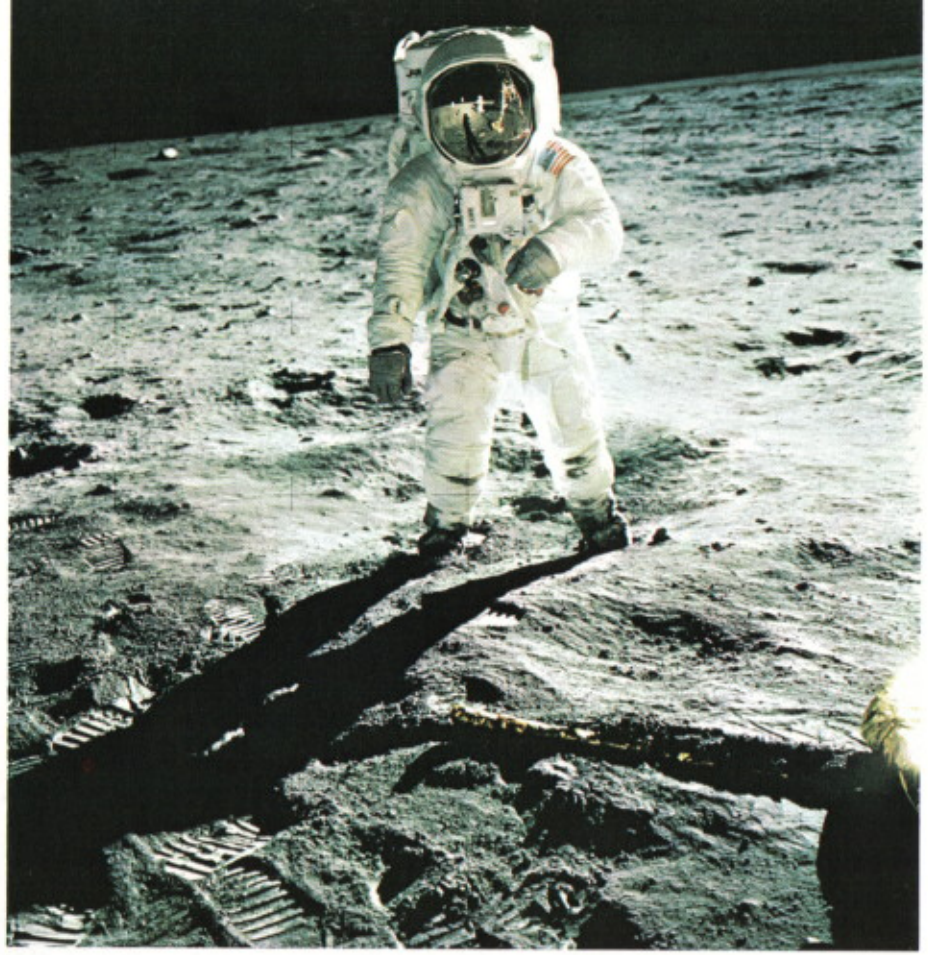
Below: The flag that established Tranquility Base, Aldrin beside it.

Lower left: Aldrin, walking away from camera, prepares to set up two instruments from the experiment package.





Tranquility Base. Reflected in the golden face visor of Astronaut Aldrin are the Eagle, Commander Armstrong, the flag and deployed experiment instruments.



The commemorative plaque bearing the names of the crew members and President Nixon.

Right: Armstrong and Aldrin unfurl U.S. flag on Moon and are photographed by automatic camera in LM window.

JULY 21

12:54 a.m.–After checking with Mission Control to make sure all chores have been completed, experiments set up, and photographs taken, Aldrin starts back up the ladder to re-enter the LM.
1:09 a.m.–Armstrong joins Aldrin in the landing craft.
1:11 a.m.–The hatch is closed. The astronauts begin removing the portable life support systems on which they have depended for two hours and 47 minutes.
4:25 a.m.–Astronauts are told to go to sleep, after attending to final housekeeping details and answering a number of questions concerning the geology of the Moon.
9:44 a.m.–Shortly after arousing Collins, still circling the Moon in the Command/Service Module, Mission Control observes: "Not since Adam has any human known such solitude as Mike Collins is experiencing during this 47 minutes of each lunar revolution when he's behind the Moon with no one to talk to except his tape recorder aboard Columbia."
11:13 a.m.–The astronauts in Eagle are aroused. Aldrin announces: "Neil has rigged himself a really good hammock . . . and he's been lying on the hatch and engine cover, and I curled up on the floor."
12:42 p.m.–Answering a question raised before they went to sleep, Aldrin reports: "We are in a boulder field where boulders range generally up to two feet, with a few larger than that. . . . Some of the boulders are lying on top of the surface, some are partially exposed, and some are just barely exposed."
1:54 p.m.–Ascent engine is started and LM, using descent stage as a launch pad, begins rising and reaches a vertical speed of 80 feet per second at 1,000 feet altitude.

The astronauts take with them in the ascent stage the soil samples, the aluminum foil with the "solar wind" particles it has collected, the film used in taking photographs with still and motion picture cameras, the flags and other mementos to be returned to Earth. Behind they leave a number of items, reducing the weight of the ship from 15,897 pounds as it landed on the Moon to 10,821 pounds.

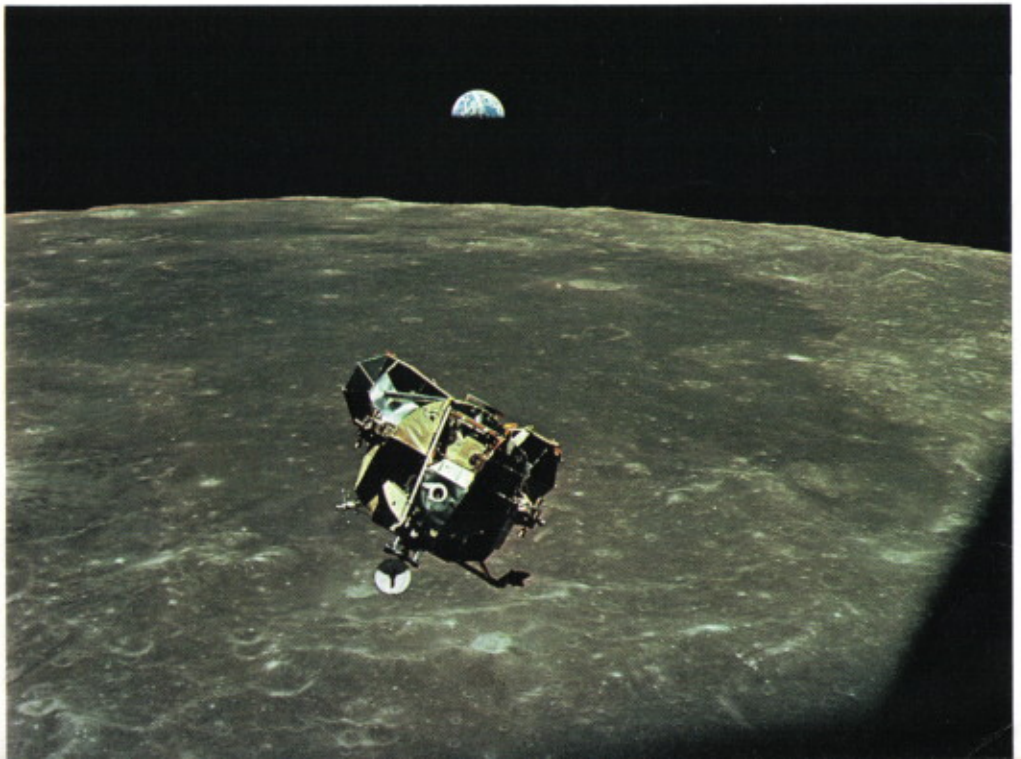
The largest item left behind is the descent stage, that part of the landing craft with the plaque on one of its spidery legs. Others include the TV camera, two still cameras, tools used in collecting samples, portable life support systems, lunar boots, American flag, rod support for the "solar wind" experiment instrument, laser beam reflector, seismic detector, and a gnomon, a device to verify colors of objects photographed.
5:35 p.m.–Eagle redocks with Columbia while circling on the back side of the Moon.
7:42 p.m.–The landing craft is jettisoned.

JULY 22

12:56 a.m.–While on the back side of the Moon, with the LM 20 miles behind the CSM, the transearth injection burn of Apollo 11 is begun, with the spacecraft traveling at 5,329 feet per second at an altitude of about 60 nautical miles.
4:30 a.m.–Astronauts start sleep period.
1:00 p.m.–Astronauts begin waking for first full day of return trip.
1:39 p.m.–Spacecraft passes point in space, 33,800 nautical miles from the Moon and 174,000 from the Earth, where the Earth's gravity takes over and begins drawing the astronauts homeward.
4:02 p.m.–Midcourse correction is made to readjust the flight path of the spacecraft.
9:08 p.m.–Eighteen minutes of live TV transmission to Earth begins.

JULY 23

2:14 a.m.–Crew starts sleep period.
12:20 p.m.–Crew awakens. Begins relaxed checking of systems and conversation with Mission Control.
3:56 p.m.–Spacecraft passes midway point of journey homeward, 101,000 nautical miles from splashdown.
7:03 p.m.–Final color television transmission begins.



Homeward bound. Armstrong and Aldrin, inside the ascent stage just after taking off from the Moon, start the first leg of their return trip to Earth, shown above the curving lunar surface.

JULY 24

6:47 a.m.–Crew awakens and begins to prepare for splashdown.
12:21 p.m.–Command and service modules are separated.
12:35 p.m.–Command module re-enters the Earth's atmosphere.
12:51 p.m.–Spacecraft splashes down 825 nautical miles southwest of Honolulu and about 13 nautical miles from the recovery ship, the U.S.S. Hornet.
1:20 p.m.–Hatch of command module opens and frogman hands in isolation suits.
1:28 p.m.–Astronauts emerge from the spacecraft in isolation suits and are sprayed with a disinfectant as a guard against the possibility of their contaminating the Earth with Moon "germs."
1:57 p.m.–Astronauts arrive by helicopter on the flight deck of the Hornet. Still inside the helicopter they ride an elevator to hangar deck and then walk immediately into the mobile quarantine trailer in which they will remain until they arrive at the Lunar Receiving Laboratory at Houston early July 27.
3:00 p.m.–President Nixon welcomes the astronauts, visible through a window of the trailer. Speaking over an intercom, he greets them, extends them an invitation to attend a dinner with him August 13. and tells them:

"This is the greatest week in the history of the world since the Creation. . . . As a result of what you have done, the world's never been closer together . . . . We can reach for the stars just as you have reached so far for the stars."

3:55 p.m.–The command module arrives on board the Hornet, after traveling 952,700 nautical miles since July 16.

So ends man's first mission to the Moon. It has lasted 195 hours, 18 minutes and 35 seconds or a little more than eight days. It is recognized as the most trouble-free mission to date, almost completely on schedule and successful in every respect.

Above: Pararescueman is shown after the splashdown spraying the astronauts, dressed in biological isolation garments, with disinfectant.

"A-Ok" is the theme of this mutual signalling through the window of the Mobile Quarantine Facility between President Nixon and the astronauts on board the U.S.S. Hornet.

EP-72
Produced by the Office of Public Affairs
National Aeronautics and Space Administration
Washington, D.C. 20546

For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402—Price 35 cents
☆ U.S. GOVERNMENT PRINTING OFFICE O—356-826